HANNA instruments®

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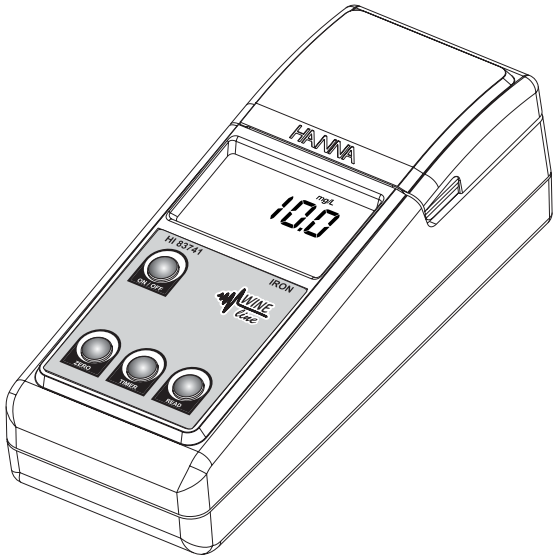
MAN83741R3 04/06

Instruction Manual

HI 83741
IRON
ISM
for wine analysis



HANNA instruments®

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CE

This Instrument is in
Compliance with the CE Directives

Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for the correct use of the instrument. Please read it carefully before using the meter. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.

This instrument is in compliance with CE directives.

TABLE OF CONTENTS

USER NOTES

Date	Iron Value (mg/L)	Notes

HANNA LITERATURE

Hanna publishes a wide range of catalogs and handbooks for an equally wide range of applications. The reference literature currently covers areas such as:

- **Water Treatment**
- **Process**
- **Swimming Pools**
- **Agriculture**
- **Food**
- **Laboratory**

and many others. New reference material is constantly being added to the library.

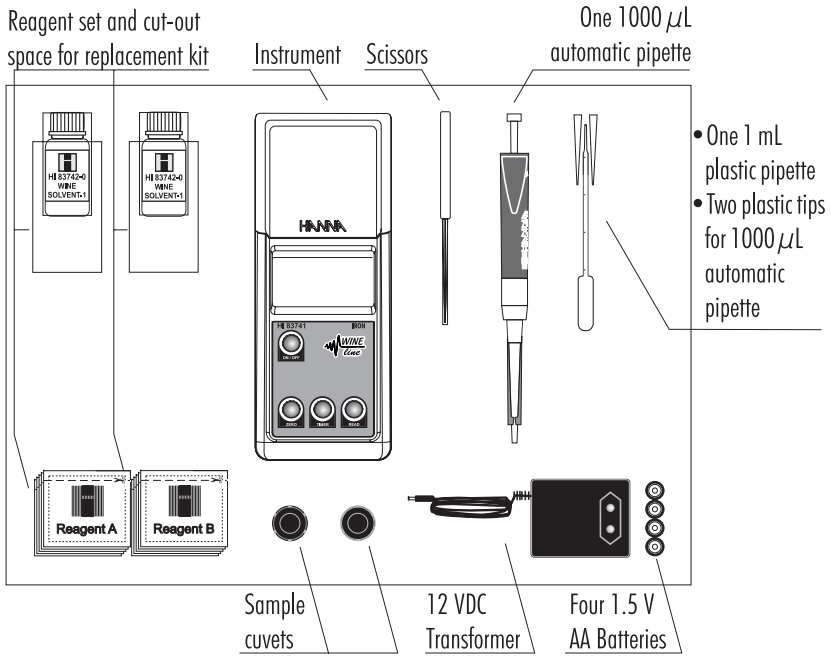
For these and other catalogs, handbooks and leaflets contact your dealer or the Hanna Customer Service Center nearest to you. To find the Hanna Office in your vicinity, check our home page at www.hannainst.com.

PRELIMINARY EXAMINATION

Please examine this product carefully. Make sure that the instrument is not damaged. If any damage occured during shipment, please notify your Dealer.

Each **HI 83741** Ion Selective Meter is supplied complete with:

- Two sample cuvets and caps
- Reagents for 5 tests (HI 83741A-0, HI 83741B-0, HI 83742-0)
- Scissors
- One 1000 µL automatic pipette with Instruction Sheet
- Two plastic tips for 1000 µL automatic pipette
- One 1 mL plastic pipette
- 12 VDC transformer (**HI 710005** or **HI 710006**)
- Four 1,5V AA batteries
- Tissue for wiping cuvets
- Instruction manual
- Instrument Quality Certificate
- Rigid carrying case



Note: save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

GENERAL DESCRIPTION

The **HI 83741** is an auto-diagnostic portable microprocessor meter that benefits from Hanna's years of experience as a manufacturer of analytical instruments. It has an advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows most accurate and repeatable readings. All instruments are factory calibrated.

The auto-diagnostic feature of this meter ensures always optimal measurement conditions to ensure most precise readings. The light level is automatically adjusted each time a zero-measurement is made, and the temperature of the lamp is controlled to avoid overheating.

SIGNIFICANCE OF USE

Trace iron concentrations in wine are beneficial for enzyme activity, as stabilizer, and as a functional component for proteins.

At higher concentrations it alters the redox potential, in favouring oxidation, affecting sensory characteristics and participating in the formation of complexes with tannin and phosphates resulting in instabilities (casse). The most common iron case is 'white casse' (iron phosphate), it is initially seen as milky white cloud and later as a precipitate. The 'blue casse' (ferric tannate) that occours less often can be observed in white wines for example after tannic acid additions.

Most of the iron present in wine is present in the ferrous Fe(II) state. The ratio of the Fe(II)/Fe(III) depends on the oxidation state of the wine. If Fe(III) is formed, it can bind with phosphates that are normally present in wine.

Since iron strongly binds with several organic acids, some wine makers add citric acid to the wine to complex free iron if the concentration exceeds 5 mg/L.

If no contatamination occurs the normal iron concentrations in must range from 1 to 5 ppm. The most important source of iron in wine is contact with iron containing alloys during processing. During fermentation a part of the iron is absorbed by yeast and thus removed from the wine during filtration.

Casse formation depends on: iron concentration, pH, ORP, phosphate, content and the type of wine.

white casse formation	white casse inhibition
iron concentration > 7 ppm	iron concentration < 5 ppm
high redox potential (Fe3+ present)	clarification with bentonite
pH 2.9-3.6	citric acid addition 12-24 g/hL

CE DECLARATION OF CONFORMITY

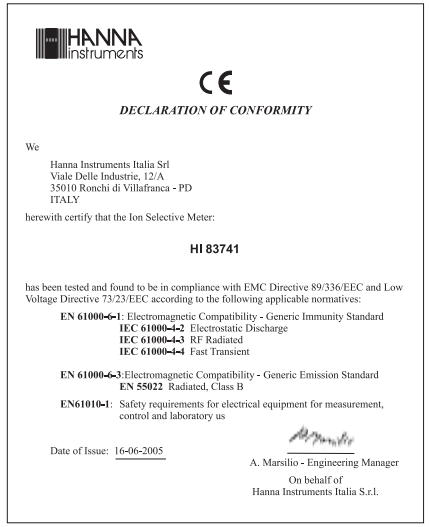
Recommendations for Users

Before using these products, make sure that they are entirely suitable for your specific application and for the environment in which they are used.

Operation of these instruments may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

To avoid damages or burns, do not put the instrument in microwave ovens. For yours and the instrument safety do not use or store the instrument in hazardous environments.



HANNA instruments

CE

DECLARATION OF CONFORMITY

We

Hanna Instruments Italia Srl
Viale Delle Industrie, 12/A
35010 Ronchi di Villafranca - PD
ITALY

herewith certify that the Ion Selective Meter:

HI 83741

has been tested and found to be in compliance with EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC according to the following applicable normatives:

EN 61000-6-1: Electromagnetic Compatibility - Generic Immunity Standard
IEC 61000-4-2 Electrostatic Discharge
IEC 61000-4-3 RF Radiated
IEC 61000-4-4 Fast Transient

EN 61000-6-3:Electromagnetic Compatibility - Generic Emission Standard
EN 55022 Radiated, Class B

EN61010-1: Safety requirements for electrical equipment for measurement, control and laboratory us

Date of Issue: 16-06-2005

A. Marsilio - Engineering Manager
On behalf of
Hanna Instruments Italia S.r.l.

WARRANTY

HI 83741 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions.

This warranty is limited to repair or replacement free of charge.

Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact your dealer. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred.

If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization Number from the Customer Service Department and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

BATTERIES REPLACEMENT

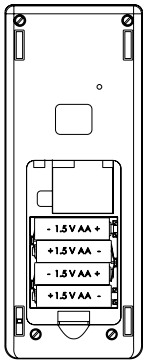
Battery replacement must only take place in a non-hazardous area.

The blinking "🔋" will appear when the batteries power gets low.

When batteries are completely discharged, "0% bAtt" will appear and after two seconds the instrument is switched off.

Remove the battery cover from the bottom of the instrument and change the old batteries with 4 fresh 1.5V batteries, paying attention to the correct polarity.

Replace the cover.



ACCESSORIES

REAGENT SETS

HI 83741-20	Iron reagents set for wine (20 tests)

OTHER ACCESSORIES

HI 740027P	1.5V AA batteries (10 pcs)
HI 731318	Tissue for wiping cuvets (4 pcs)
HI 731321	Glass cuvets (4 pcs)
HI 731325W	Caps for cuvets (4 pcs)
HI 93703-50	Cuvets cleaning solution (230 mL)
HI 731341	1000 µL automatic pipette
HI 731351	Plastic tips for 1000 µL automatic pipette (25 pcs)

SPECIFICATIONS

Range	0.0-15.0 mg/L
Resolution	0.1 mg/L
Precision	SD ±0.4 mg/L @ 4.0 mg/L
Light Source	Tungsten lamp with narrow band interference filter @ 560 nm
Light Detector	Silicon Photocell
Method	The reaction between Iron and the reagents causes a purple tint in the sample.
Environment	0 to 50°C (32 to 122°F); max 95% RH non-condensing
Battery Type	4 x 1,5 volt AA batteries / 12 to 20 VDC through voltage adapter
Auto-Shut off	After 15' of non-use in *measurement mode*.
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17,6 oz.)

REQUIRED REAGENTS

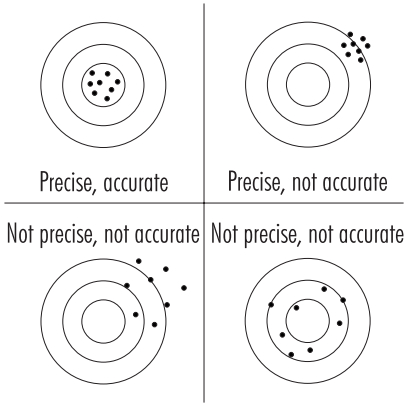
Code	Description	Quantity/test
HI 83741A-0	Iron Reagent A	1 packet
HI 83741B-0	Iron Reagent B	1 packet
HI 83742-0	Wine solvent-1	9 mL

PRECISION AND ACCURACY

Precision is how closely repeated measurements agree with each other. Precision is usually expressed as standard deviation (SD). Accuracy is defined as the nearness of a test result to the true value.

Although good precision suggests good accuracy, precise results can be inaccurate. The figure explains these definitions.

In a laboratory using a standard solution of 4.0 mg/L iron and a representative lot of reagent, an operator obtained with a single instrument a standard deviation of 0.4 mg/L.



PRINCIPLE OF OPERATION

Absorption of Light is a typical phenomenon of interaction between electromagnetic radiation and matter. When a light beam crosses a substance, some of the radiation may be absorbed by atoms, molecules or crystal lattices.

If pure absorption occurs, the fraction of light absorbed depends both on the optical path length through the matter and on the physical-chemical characteristics of the substance according to the Lambert-Beer Law:

$$-\log I/I_{\circ} = \varepsilon_{\lambda} \, c \, d$$

or

$$A = \varepsilon_{\lambda} \, c \, d$$

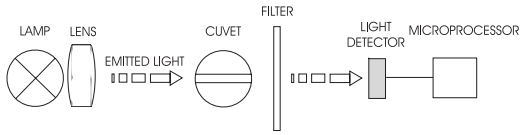
Where:

$-\log I/I_{\circ}$	=	Absorbance (A)
$I_{\circ}$	=	intensity of incident light beam
I	=	intensity of light beam after absorption
ε_{λ}	=	molar extinction coefficient at wavelength λ
c	=	molar concentration of the substance
d	=	optical path through the substance

Therefore, the concentration "c" can be calculated from the absorbance of the substance as the other factors are known.

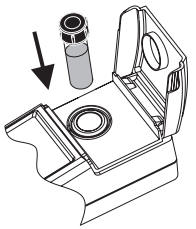
Photometric chemical analysis is based on the possibility to develop an absorbing compound from a specific chemical reaction between sample and reagents. Given that the absorption of a compound strictly depends on the wavelength of the incident light beam, a narrow spectral bandwidth should be selected as well as a proper central wavelength to optimize measurements.

The optical system of Hanna's **HI 83000** series colorimeters is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.



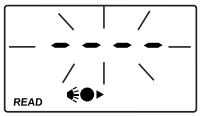
Block diagram (optical layout)

- Reinsert the cuvet into the instrument and close the lid.



- Press TIMER and the instrument will show the countdown or, alternatively, wait for 2 minutes. At the end an acoustic signal alerts the user that the countdown has finished.

- Press READ and the display will show "----" during measurement.

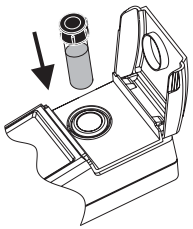


- The instrument directly displays concentration in mg/L (ppm) of iron on the Liquid Crystal Display.

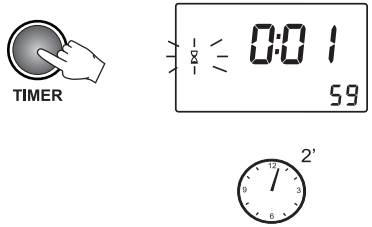
  Note

  If the iron concentration exceeds 15.0 ppm or if the sample is very turbid, it is recommended to dilute the sample 5 times (see "General tips for an accurate measurement", page 11) and repeat the measurement procedure. In this case the displayed value needs to be multiplied by 5 to compensate for dilution.

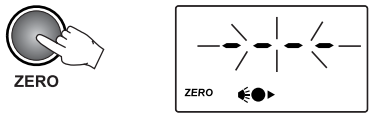
- Place the cuvet into the holder and close the lid.



- Press TIMER and the instrument will show the countdown or, alternatively, wait for 2 minutes. The instrument gives an acoustic signal to alert the user that the countdown is finished.

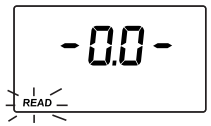


- Press ZERO and "----" will blink on the display.



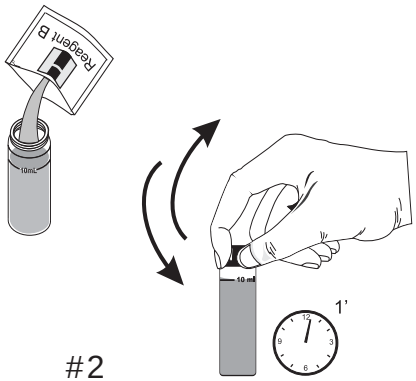
- After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for measurement

  Note: If the "L Lo" (Low Light) message appears, the sample must be diluted. See "General tips for an accurate measurement" (page 11).



- Remove the cuvet from the instrument and open the cap.

- Add the content of one powder packet of HI 83741B-0 reagent B. Replace the cap and shake gently for 1 minute to dissolve the reagent.



#2

A microprocessor controlled special tungsten lamp emits radiation which is first optically conditioned and beamed to the sample contained in the cuvet. The optical path is fixed by the diameter of the cuvet. Then the light is spectrally filtered to a narrow spectral bandwidth, to obtain a light beam of intensity I_0 or I.

The photoelectric cell collects the radiation I that is not absorbed by the sample and converts it into an electric current, producing a potential in the mV range.

The microprocessor uses this potential to convert the incoming value into the desired measuring unit and to display it on the LCD.

The measurement process is carried out in two phases: first the meter is zeroed and then the actual measurement is performed.

The cuvet has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and the calibration (zeroing) cuvets are optically identical to provide the same measurement conditions. Whenever possible use the same cuvet for both. It is necessary that the surface of the cuvet is clean and not scratched. This to avoid measurement interference due to unwanted reflection and absorption of light. It is recommended not to touch the cuvet walls with hands.

Furthermore, in order to maintain the same conditions during the zeroing and the measuring phases, it is necessary to close the cuvet to prevent any contamination.

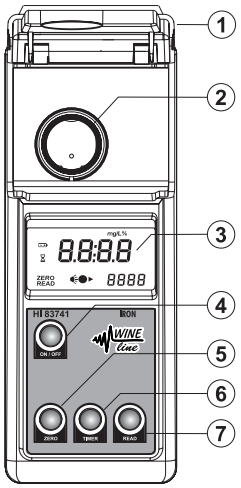
ABBREVIATIONS

EPA: US Environmental Protection Agency
°C: degree Celsius
°F: degree Fahrenheit
mg/L: milligrams per liter. mg/L is equivalent to ppm (part per million)
mL: milliliter
LCD: Liquid Crystal Display

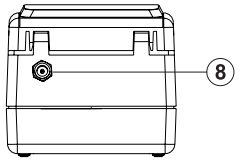
FUNCTIONAL DESCRIPTION

INSTRUMENT DESCRIPTION

FRONT

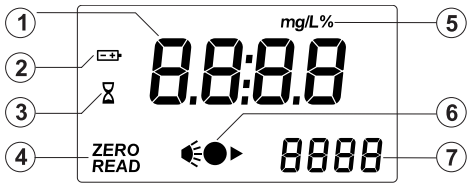


REAR



1) Lid
2) Cuvet Holder
3) Liquid Crystal Display (LCD)
4) ON/OFF key, to turn the meter on and off
5) ZERO key, to zero the meter
6) TIMER key, to activate a countdown
7) READ key, to perform measurement
8) Power Socket 12V to 20V DC 2.5 Watt

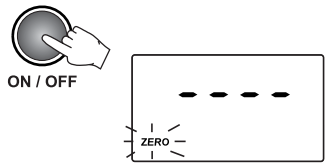
DISPLAY ELEMENTS DESCRIPTION



1) Four digit main display.
2) Battery icon: appears when the battery voltage is getting low.
3) The hourglass icon: appears during the countdown.
4) Status information.
5) Measurement unit.
6) Lamp status indicator.
7) Four digit secondary display.

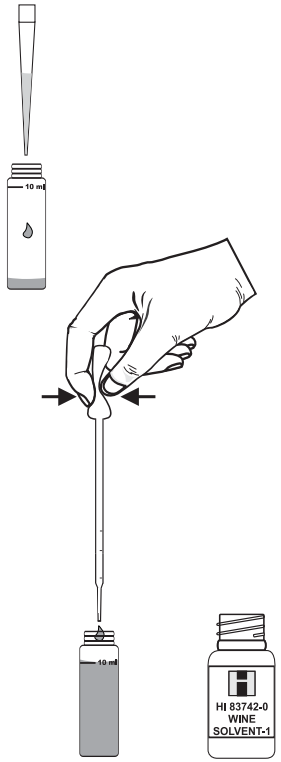
MEASUREMENT PROCEDURE

- Turn the instrument on by pressing ON/OFF.



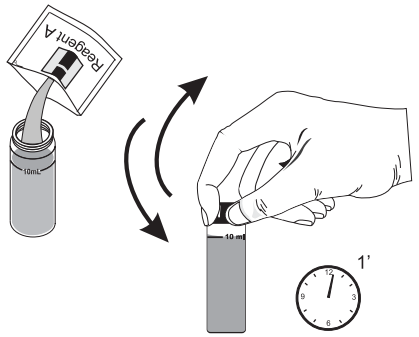
- When the LCD displays "---", it is ready.

- Use the 1000 μL automatic pipette to add exactly 1 mL of wine sample to an empty cuvet.
  For a correct use of the automatic pipette please follow the related Instruction Sheet.



- Use the plastic dropper pipette to fill the cuvet up to the 10 mL mark with wine solvent-1 (HI83742-0).

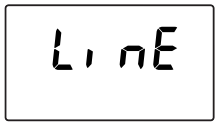
- Add the content of one powder packet of HI 83741A-0 reagent A. Replace the cap and shake gently for 1 minute to dissolve the reagent.

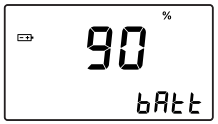


- Whenever the cuvet is placed into the measurement cell, it must be dry outside, and completely free of fingerprints, oil or dirt. Wipe it thoroughly with **HI 731318** (tissue for wiping cuvets, see chapter ACCESSORIES) or a lint-free cloth prior to insertion.
- Do not let the reacted sample stand too long after reaction, or accuracy will be lost.
- After the reading it is important to discard immediately the sample, otherwise the glass might become permanently stained.
- All the reaction times reported in this manual are referred to 20°C (68°F). As a general rule of thumb, they should be doubled at 10°C (50°F) and halved at 30°C (86°F).

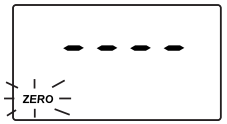
GUIDE TO DISPLAY CODES

This prompt appears for a few seconds each time the instrument is turned ON.



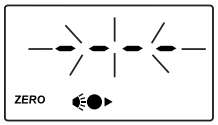


These prompts indicate the type of power supply: "Line" (if the external power supply is used) or the battery level.

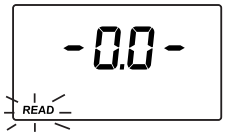


Indicates that the instrument is in a ready state and waiting for the next command (Timer or Zero).

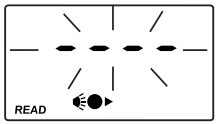
After Timer is pressed, a blinking hourglass icon appears and the display shows a 2 minutes coundown. Also the Zero tag might blink if no zero measurement has been made before. At the end an acoustic signal alerts the user that the countdown has finished.



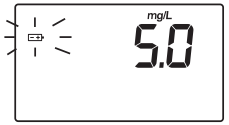
Indicates that the meter is performing a zero measurement. The light intensity is automatically re-adjusted (auto-calibration features) if necessary.



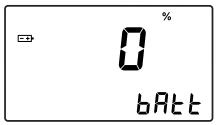
The instrument is zeroed and a measurement can be made.



Indicates that the meter is making a measurement.



Batteries voltage is getting low and the batteries need to be replaced.

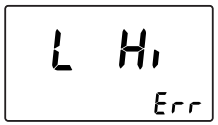


Indicates that the batteries are dead and must be replaced. After this message appears, the instrument is switched off. Change the batteries and restart the meter.

ERROR MESSAGES

The meter has lost its configuration. Contact your dealer or the nearest Hanna Customer Service Center.

a) on zero reading:



"Light high": there is too much light to perform a measurement. Please check the preparation of the zero cuvet.

"Light low": there is not enough light to perform a measurement. Please dilute the sample five times (see "General tips for an accurate measurement", page 12).

"No Light": the lamp is not working because of a malfunction. Contact your dealer or the nearest Hanna Customer Service Center.

b) on sample reading:

"Inverted": the sample and the zero cuvet are inverted.

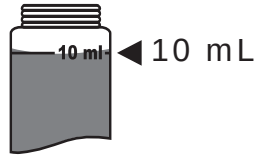
The sample absorbs less light than the zero reference. Check the procedure and make sure you use the same cuvet for reference (zero) and measurement.

A flashing value of the maximum concentration indicates an over range condition. The concentration of the sample is beyond the programmed range: dilute the sample and measure again.

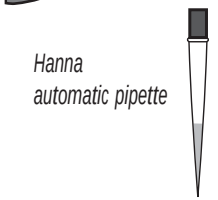
GENERAL TIPS FOR AN ACCURATE MEASUREMENT

The instructions listed below should be carefully followed during testing to ensure best accuracy.

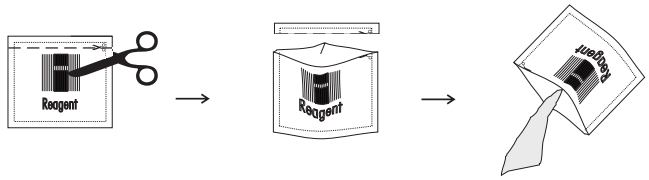
- For a correct filling of the cuvet: the liquid in the cuvet forms a convexity on the top; the bottom of this convexity must be at the same level of the 10 mL mark.



- For dosing the wine sample, we recommend to use the supplied Hanna HI 731341 automatic pipette.
  For a correct use of the Hanna automatic pipette, please follow the related Instruction Sheet.



- Proper use of the powder reagent packet:
  (a) use scissors to open the powder packet;
  (b) push the edges of the packet to form a spout;
  (c) pour out the content of the packet.



(a) (b) (c)

- In order to avoid reagent leaking and to obtain more accurate measurements, it is recommended to close the cuvet first with the supplied HDPE plastic stopper  and then with the black cap.

- Diluting procedure: Use the 1000 µL automatic pipette to add twice exactly 1 mL of sample to an empty cuvet. Then fill the cuvet up to the mark with iron-free deionized water. Close the cap and invert the cuvet several times. This is the diluted sample. Follow the measurement procedure. The final reading must be multiplied by 5 to compensate for dilution.